

<b>EPA</b> United States Environmental Protection Agency Washington, DC 20460 <b>Work Assignment</b>		Work Assignment Number 0-35																																																																			
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Contract Number EP-C-16-003		Contract Period   07/01/2016   To   06/30/2017 Base   X                      Option Period Number																																																																			
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**PERFORMANCE WORK STATEMENT  
CONTRACT EP-C-16-003  
WORK ASSIGNMENT 0-35**

**TITLE:** Using GI to Improve Drought Resilience in the Commonwealth of Massachusetts

**WORK ASSIGNMENT CONTRACTING OFFICER'S REPRESENTATIVE (WACOR):**

Mark Voorhees  
US Environmental Protection Agency, Region 1  
5 Post Office Square, Suite 100  
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Phone: 617-918-1537  
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**ALTERNATE WORK ASSIGNMENT CONTRACTING OFFICER'S  
REPRESENTATIVE (AWACOR):**

Rosemary Monahan  
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5 Post Office Square, Suite 100  
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Boston, Massachusetts

Phone: 617-918-1087  
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**PERIOD OF PERFORMANCE:** March 23, 2017 through June 30, 2017

**BACKGROUND:** The work to be performed under this work assignment is in response to an internal-to-EPA request for proposals issued by the Office of Water to EPA Regional Offices for pilot projects to work with the Federal Emergency Management Agency (FEMA) Regional Offices and explore how to integrate green infrastructure (GI) into state or local hazard mitigation plans. In this work assignment, the Contractor will be assisting the EPA Region 1 office with this pilot effort to suggest ways to integrate GI, with a focus on drought resilience, into the Commonwealth of Massachusetts' Hazard Mitigation Plan, which is currently undergoing an update. This work is intended to be a national model for how EPA Regional offices can work with states on GI as a way to mitigate drought, flooding, and other hazards.

There have been four major statewide droughts in Massachusetts since the 1920s. The worst, which all others are compared to, lasted from 1961 to 1969, causing wells to go dry and significant water supply shortages throughout the state. In 1965 emergency water supplies were being used in 23

communities. By 1967, the Quabbin Reservoir was at 45 percent of capacity. The only part of the state without serious drought concerns was Cape Cod.

In 2016, Massachusetts experienced a severe drought. With over nine months of below normal rainfall, more than 80% of the state is in a level 4, Drought Warning. Stream flows and groundwater were below normal for the 8<sup>th</sup> month in a row in much of the state, and other hydrological indices have also been affected. This has had a tremendous impact on flows in our rivers and streams, habitat that depends on critical summer flows, fisheries, recreation, agricultural resources, and in some cases on public water supply systems which have had to rely on interconnections with other towns and systems.

Climate change predictions for Massachusetts call for increased short-burst events with heavy rainfall causing flooding. The lack of enough recharge due to increased impervious cover will make the impacts of these rainfall events more severe. Climate models also predict increased droughts, especially short term droughts. The impact of the 2016 drought is being felt in hundreds of communities across the state, with mandatory water use restrictions required to protect water supplies as well as environmental and agricultural resources. These restrictions subsequently cost community water suppliers much needed revenue in order to operate and maintain their systems. Recently five communities needed to purchase emergency water from the regional water supplier resulting in a total expense of over \$1.3 million. If communities could proactively adopt practices that both reduce flooding and provide resilience to droughts they will save money and reduce future risk.

The state is currently very engaged with activities related to drought including: coordinating among state and federal agencies; monitoring drought indices; providing loans for farmers and small businesses; doing outreach and technical assistance; and maintaining a drought related website and information sharing on what to do. The state is also actively promoting low impact development and GI practices to comply with state stormwater performance standards for development projects and NPDES Phase II permit requirements.

As noted earlier, the State Hazard Mitigation plan is currently undergoing an update, and as a result of state Executive Order 569, “Establishing an Integrated Climate Change Strategy for the Commonwealth,” signed by Governor Baker on September 16<sup>th</sup>, 2016 the State Hazard Mitigation plan update will be written to also meet the requirement for a state Climate Adaptation Plan. The State is on a tight deadline to be able to submit a draft plan to FEMA in January 2018, for approval by FEMA by July 2018.

A “Climate Smart Region” project is now underway with the 14 communities around metro Boston. This effort includes the development of a GI mapping tool for climate planning. The project is being done by the Trust for Public Land and the Metropolitan Area Planning Council (MAPC). This effort is intended to produce a tool that can be used elsewhere in the Commonwealth and other states with a similar hydrologic regime, to identify areas where GI could be prioritized to accomplish multiple goals. Currently, the mapping tool does not include consideration of drought. (See Attachment A for description of the project.)

This work assignment (WA 0-35) will support EPA Region 1's work with project partners ([FEMA], the Commonwealth of Massachusetts and the Trust for Public Land) to explore appropriate data layers and ways to consider drought resilience in the GI mapping. The appropriate scale of analysis and location for a pilot mapping exercise will be identified with project partners. The Trust for Public Land will produce static maps for the project.

WA 0-35 is expected to further enhance EPA's ability to work with states on using GI to mitigate drought, flooding, and other hazards that are addressed in state hazard mitigation plans. The Contractor's support shall focus on the issue of drought resilience, and identifying ways and locations where the state could use GI as a drought resilience measure. This technical support shall include specific options that could be incorporated into the State plan or taken under advisement for future plan updates.

This work assignment will support the following key areas of focus for EPA:

- 1) Expand the range of options used to mitigate both drought and flood risk.
- 2) Institutionalize using GI as a way to reduce drought impacts and improve drought resilience at the state level in a region of the country where drought is currently less common, but likely to increase with a changing climate.
- 3) Enable FEMA funds to be directed to GI projects for drought resilience.
- 4) Promote the understanding of the multiple benefits of GI including improvements in aquifer recharge; base stream flow and stream temperature; water quality; soil health; hydrology; climate mitigation; water supply; and quality of life.

#### **PURPOSE AND OBJECTIVE:**

WA 0-35 shall support a project that will serve as a model for how GI can be used to reduce impacts from drought and improve resilience to drought. The Contractor shall provide technical support to EPA and our partners (FEMA, the Commonwealth of Massachusetts, Trust for Public Land and the MAPC) to improve future drought resilience in the Commonwealth of Massachusetts. The work performed for this project will not only serve to benefit the state Hazard Mitigation and Climate Adaptation Plan, but also local and regional plans that look to the state plan for guidance. The Contractor shall work with EPA and project partners to meet the following objectives:

- 1) **Technical Support for Drought Mapping.** The Contractor shall provide technical support to EPA and our partners in identifying data layers and/or mapping methods that will enable the prioritization of geographic areas where GI would be beneficial for drought resilience as well as other benefits such as flood reduction and pollutant removal. This task will build on existing mapping of GI that is being done for the Boston Metro area by the Trust for Public Land.
- 2) **Convene a workshop** with diverse stakeholders to review options for managing GI for drought resilience; identify barriers to implementation; and determine if policy changes might be necessary at the state and/or local levels.

- 3) **Share the results of the project.** Based on the results of the workshop, the Contractor shall develop a report on options for EPA and our partners to consider as possible actions to achieve broader use of GI for multiple benefits, primarily including increasing resilience to drought. The report shall also include options for addressing the barriers that were identified during the project and at the workshop, as well as options for incorporating GI into the Commonwealth's Hazard Mitigation and Climate Adaptation Plan.

## **SCOPE OF WORK**

### **Task 0 - Project Management**

**A) Work Plan:** The Contractor shall prepare a Work Plan for EPA's approval. The Work Plan shall describe how the Contractor shall accomplish each of the tasks. The Contractor shall provide qualified staff to perform the work and a Project Manager to oversee all project activities. The Contractor shall ensure that the work plan provides enough detail to clearly describe:

- Specific objectives of the project(s) supported by this work assignment, including typical questions that must be answered when collecting and presenting information on GI practices to improve drought resilience.
- The type of information to be gathered or used under this work assignment to support the project objectives—including data from search engines, federal reports or databases, EPA reports or databases, and State reports or databases—as a well as a rationale for when those databases or reports are appropriate and what data or information available in each will support the project.

The work plan shall be submitted to the CL-COR/WACOR in accordance with contract requirements.

**B) Project Coordination:** This task also includes contract management such as communications between EPA Contracting Officer Representatives and their respective contractor counterparts. These communications would concern the progress made on the work assignment tasks and coordination of activities to facilitate optimal contractor performance. The Contractor shall work closely with the WACOR and the project team and shall schedule a project kickoff call with the WACOR within 5 business days of issuance of WA 0-35. The Contractor shall consult the WACOR for major technical decisions, especially during the project kickoff and the final project delivery meetings.

**C) Reporting:** The contractor shall provide electronic copies of the monthly progress reports to the WACOR and CL-COR. Each progress report shall describe the technical work and expenditures for the same time period as the corresponding invoice. The reports shall list by task the amount of work completed and include a table of hours by personnel for each task. The reports also shall identify any problems or difficulties.

### **Deliverables:**

- A) The Contractor shall submit a Work Plan in accordance with contract requirements **after the date of issuance of WA 0-35.**

B) The Contractor shall schedule a kickoff call with the WACOR **within 5 business days of receiving the WA 0-35**. The Contractor will maintain communication with the WACOR and shall host bi-weekly conference calls throughout the project.

C) The Contractor shall submit monthly progress reports in accordance with contract requirements.

### **Task 1 – Quality Assurance Project Plan**

To accomplish some of the work assignment objectives, it will be necessary for the Contractor to review existing environmental information on GI practices and possibly geospatial data layers (also known as “secondary” use of data or information). Therefore, the Contractor shall develop a Quality Assurance Project Plan (QAPP) for all activities that involve assembling, reviewing and using existing environmental information. Specifically, the QAPP shall provide enough detail to clearly describe:

- The quality objectives needed to ensure the data or information will support the project objectives, and
- The QA/QC activities to be performed to ensure that any information obtained are documented and are of the type, quality, transparency, and reproducibility needed.

#### **Deliverables:**

A) The Contractor shall provide a draft QAPP for EPA review, **at the time of submitting the Work Plan**.

B) The Contractor shall submit ta final QAPP **within 5 business days after receiving comments on the draft QAPP from the WACOR**.

### **Task 2 - Technical Support for Drought Mapping**

The Contractor shall provide technical support to EPA and project partners in identifying data layers and/or mapping methods that will enable the prioritization of geographic areas where GI would be beneficial for drought resilience as well as other benefits such as flood reduction and pollutant removal. The Trust for Public Land will produce static maps, building upon the work they are currently doing with the Metropolitan Area Planning Council (MAPC) to develop a GI mapping tool to identify areas where GI could be prioritized to accomplish multiple goals. Currently, the mapping tool does not include consideration of drought resilience.

Work under Task 2 shall include scheduling and participating in a project partners meeting and preparing a technical memorandum. The project partners meeting will include a demonstration of the current Trust for Public Land mapping tool; discussion of data layers needed to incorporate drought resilience considerations; and identification of a location and the appropriate scale for a pilot mapping exercise to demonstrate the mapping tool. The technical memorandum shall include an evaluation of potential data layers and approaches for expanding the mapping tool to include drought resilience. Ultimately, EPA intends that work performed under Task 2 to provide the basis

for the Contractor to prepare a draft “best practice” for achieving drought resilience and multiple benefits from GI through mapping, which would potentially be included in the state’s Hazard Mitigation and Climate Adaptation Plans Appendix (See Attachment B for examples).

**Deliverables:**

A) The Contractor shall schedule and attend a meeting with project partners **within 15 business days after issuance of WA 0-35**. The WACOR shall provide the Contractor with a list of project partners to be invited to the meeting at the time of the kickoff call for WA 0-35 (see Task 0).

B) The Contractor shall submit to the WACOR a draft technical memorandum (in electronic format) **within 15 business days after the project partners meeting**.

C) The Contractor shall submit a final Task 2 technical memorandum **within 5 business days after receiving comments on the draft memorandum from the WACOR**.

**Task 3 - Green Infrastructure Analysis: Barriers and Opportunities for Drought Resiliency**

The Contractor shall conduct a preliminary analysis of potential barriers in the Commonwealth’s statutes, policies, and programs. Relevant state policies and programs include, but are not limited to, the Interbasin Transfer Act, the Water Management Act, and source water protection and water reuse policies. This analysis will be used as a foundation for the workshop discussion. The Contractor shall also present information on GI practices that are effective at improving drought resilience as well as achieving other benefits, including flood risk reduction and pollutant removal.

**Deliverables:**

A) The Contractor shall submit to the WACOR a Task 3 technical memorandum presenting the preliminary GI analysis of potential barriers and opportunities for drought resilience in the state **within 15 business days of submitting the draft Task 2 technical memorandum**.

B) The Contractor shall finalize and submit the Task 2 technical memorandum **within 5 business days after receiving comments on the draft memorandum from the WACOR**.

**Task 4 - Convene a Workshop on GI for Drought Resilience**

The Contractor shall work with EPA and our project partners to organize and facilitate a stakeholder workshop to identify options for encouraging broader use of GI, primarily for drought resilience in the state. The Contractor shall develop a draft and final workshop agenda as well as invitational materials (e.g., flyer) that EPA and our partners can use to advertise the workshop to diverse local, regional, state, and federal stakeholders. EPA or one of our partners will host the workshop in a government facility, so the Contractor will not be responsible for procuring space. The Contractor shall be responsible for facilitating the workshop and taking notes for use in Task 5, below.

The Contractor shall organize the workshop to accomplish the following:

- A. The Trust for Public Land will present the results from the mapping approach in the pilot area described in Task 2, above.
- B. Contractor shall present information on GI practices that are effective at improving drought resilience as well as achieving other benefits, including flood risk reduction and pollutant removal.
- C. The Contractor shall present a preliminary analysis of potential barriers in the Commonwealth's statutes, policies, and programs (see Task 3). Relevant state policies and programs include, but are not limited to, the Interbasin Transfer Act, the Water Management Act, and source water protection and water reuse policies. This analysis will be used as a foundation for the workshop discussion.
- D. the Contractor shall lead a discussion(s) among workshop participants to further identify barriers to broader implementation of GI practices by state and local entities, and to explore what the best options are, and whether policy or other changes are necessary to remove these barriers to implementation

#### **Deliverables:**

- A) The Contractor shall develop a draft agenda, invitational materials (including an invitation list) and proposed dates for the workshop for review by project partners **within 10 business days of the project partners meeting. (Task 2).**
- B) The Contractor shall submit final versions of the workshop materials for distribution by the project partners and identify an agreed upon date for the workshop **within 5 business days of receiving comments on the draft workshop materials from the WACOR.**
- C) The Contractor shall give presentations and facilitate discussion on barriers and options at the workshop **to be held no later than May 31, 2017.**

#### **Task 5 - Report on GI options for drought resilience**

Based on the results of the workshop and work under previous Tasks, the Contractor shall develop a report on options for EPA and our partners to consider as possible actions to achieve broader use of GI for multiple benefits, primarily including increasing resilience to drought. The report shall also include options for addressing the barriers that were identified during Task 3 and discussed at the workshop, and options for incorporating GI into the Commonwealth's Hazard Mitigation and Climate Adaptation Plan. The report will also include, a draft "Best Practice" case study of the mapping exercise identified in Task 2 (See Attachment B for examples).

In addition to the report, the Contractor shall prepare a PowerPoint presentation summarizing the options and findings, which they shall present to the *Massachusetts Interagency Hazard Mitigation and Climate Adaptation Project Management Team*.

**Deliverables:**

A) The Contractor shall submit to the WACOR a draft report and a PowerPoint presentation (in electronic format) **within 10 business days after the date of the workshop.**

B) The Contractor shall submit a final report and presentation **within 5 business days of receiving comments from the WACOR.**

C) The Contractor shall deliver the final PowerPoint presentation to EPA, the Massachusetts Interagency Hazard Mitigation and Climate Adaptation Project Management Team **no later than June 30, 2017.** EPA will take the lead on scheduling the presentation.

**DELIVERABLES REQUIRED AND SCHEDULE FOR COMPLETION OF TASKS**

<b>Task</b>	<b>Item Required</b>	<b>Due Date</b>	<b>Number of Copies and Format Requirements</b>
<b>0</b>	A) Work Plan  B1) Schedule Kickoff call  B2) Bi-weekly conference calls  C) Monthly progress reports	A) In accordance with contract requirements B1) 5 business days of issuance of WA 0-35 B2) Every two weeks  C) In accordance with contract requirements	A) 1 in electronic format  B1 and B2) Conference calls  C) 1 in electronic format
<b>1</b>	A) Draft Quality Assurance Project Plan (QAPP)  B) Final QAPP	A) With work plan  B) Within 5 Business days of receiving comments from WACOR.	A) 1 in electronic format  B) 1 in electronic format
<b>2</b>	A) Meeting with project partners  B) Draft Technical Memorandum    C) Final Technical Memorandum	A) Within 15 business days of issuance of WA 0-35  B) Within 15 business days of the project partners meeting   C) Within 5 business days of the receiving comments on draft Technical Memorandum from WACOR	A) In -person meeting  B) 1 in electronic format   C) 1 in electronic format
<b>3.</b>	A) Draft Technical Memorandum	A) Within 15 business days of submitting the draft Task 2 Technical Memorandum	A) 1 in electronic format

	B) Final Technical Memorandum	B) Within 5 business days of the receiving comments on the draft Task 3 Technical Memorandum from WACOR	B) 1 in electronic format
<b>4</b>	A) Workshop agenda, and materials  B) Participate in Workshop	A) Within 10 business days from the project partners meeting  B) No Later than May 31, 2017	A) 1 in electronic format  B) In-person attendance
<b>5</b>	A) Draft Report of recommended options and draft PowerPoint presentation  B) Final Report and PowerPoint presentation  C) Giver PowerPoint presentation to EPA, project partners, and the state	A) By June 1 <sup>st</sup> or within 10 business days after the workshop  B) Within 5 business days of receiving comments from the WACOR  C) By June 30, 2017	A) 1 each in electronic format  B) 1 each in electronic format  C) Live presentation

#### **ESTIMATED LEVEL OF EFFORT:**

EPA **estimates 455 hours** will be required to complete all tasks.

#### **ANTICIPATED TRAVEL REQUIREMENTS:**

Travel for up to 3 persons, on three days to Boston, Massachusetts. Technical directions will be issued by the WACOR within 2 weeks of the scheduled trip to clarify the specific travel dates and the number of persons required for the following tasks:

<b>Task</b>	<b>Travel Destination /Purpose</b>	<b>Travel Destination /Purpose</b>
2	EPA/Project Partners	Boston MA – attend meeting
4	Meeting	Boston, MA - facilitate workshop
5	Workshop Presentation to EPA and State	Boston, MA – give presentation

## **ADDITIONAL REQUIREMENTS:**

Office direct costs (ODCs) for copying, postage/courier, supplies, computer usage, and graphics are allowed.

Upon issuance of written technical direction, the Contractor shall submit for inspection of all work in progress at any time under this work assignment. The Contractor shall develop and maintain files supporting each task.

The Contractor shall contact the WACOR and/or the Contract Level Contracting Officer's Representative (CL-COR) by telephone to discuss any problems that may adversely affect the work on this Work Assignment. Within five (5) calendar days the Contractor shall follow the phone call with a brief written explanation of the problem, including any actions already taken, and/or recommended solutions to correct the problem. Written explanation shall be made available to the WACOR and the CL-COR.

## **CONTRACTOR IDENTIFICATION**

To avoid any perception that Contractor personnel are EPA employees, the Contractor shall assure that Contractor personnel are clearly identified as independent Contractors of EPA when attending meetings with outside parties or visiting field sites.

## **CONTROL REQUIREMENTS**

### **1A. Organizational Conflict of Interest:**

The Contractor shall warrant that, to the best of the Contractor's knowledge and belief, there are no relevant facts or circumstances which could give rise to an organizational conflict of interest, as defined in FAR Subpart 9.5, or that the Contractor has disclosed all such relevant information. See contract clause 1552.209-71 Organization of Conflict of Interest.

### **1B. Notification of Conflicts of Interest Regarding Personnel:**

The Contractor shall immediately notify the CL-COR and the Contracting Officer of (1) any actual or potential personal conflict of interest with regard to any of its employees working on or having access to information regarding this contract, or (2) any such conflicts concerning subcontractor employees or consultants working on or having access to information regarding the contract, when such conflicts have been reported to the Contractor. A personal conflict of interest is defined as a relationship of an employee, subcontractor employee, or consultant with an entity that may impair the objectivity of the employee, subcontractor employee, or consultant in performing the contract work. See Section H.4, contract clause EPAAR 1552.209-73 Notification of Conflict of Interest.

## **2. Project Employee Confidentiality Agreement**

The Contractor agrees that the Contractor employee will not disclose, either in whole or in part, to any entity external to the EPA or the Contractor, any information or data (as defined in FAR Section 27.401) provided by the government or first generated by the Contractor under this contract or any site-specific cost information without first obtaining the written permission of the CL-COR.

## **3. Conference/Meeting Guidelines and Limitations**

The Contractor shall immediately alert the WACOR to any anticipated event under the work assignment which may result in incurring an estimated \$20,000 or more cost, funded by EPA, specific to that event, meeting, training, etc. Those costs would include travel of both prime and consultant personnel, planning and facilitation costs, AV and rental of venue costs, etc. The WACOR will then prepare approval internal paperwork for the event and will advise the Contractor when appropriate signatures have been obtained. At that point, effort can proceed for the event. If the event is being sponsored by another EPA organization, the organization providing the planning is responsible for the approval.



Photo by Jeff Sachs, 2009

## **Metro Mayors Climate-Smart Region Climate Planning for Green Infrastructure**

The Metro Mayors Coalition, comprised of Boston and 13 surrounding cities and towns, faces regional challenges from our changing climate; stormwater inundation, coastal flooding, and a steep rise in extreme heat events are all projected.

All of these climate hazards cross political boundaries. For this reason, on May 13, 2015, the Mayors and Managers of the Metro Mayors Coalition, facilitated by the Metropolitan Area Planning Council (MAPC), signed a commitment to collaborate on preparing the region for climate change while continuing to reduce the region's greenhouse gas emissions.

The Trust for Public Land is working in partnership with MAPC and the 14 municipalities of the Metro Mayors Coalition to launch The Trust for Public Land's first regional-scale Climate-Smart Cities™ program to create a foundation for regional approaches to climate preparedness. This will be achieved through community outreach, municipal partnerships, a vulnerability assessment through a geographic information systems (GIS) decision-support tool, and opportunities for regional green

infrastructure solutions. The program also evaluates social vulnerabilities, climate justice, and critical infrastructure.

The program will be organized around four core objectives:

**Connect:** "Hyper-connect" and expand walk-bike corridors to provide Metro Boston area residents with enhanced carbon-free transportation networks.

**Cool:** Create urban greenspaces and increase numbers of shade trees to provide natural cooling from the powerful urban heat island effect and from more frequent extreme heat events in Metro Boston.

**Absorb:** Create "water smart" parks and playgrounds, green alleys, and other permeable surfaces to naturally capture the increased stormwater runoff.

**Protect:** Deploy a combination of waterfront parks and living shorelines, like wetlands, to protect from sea level rise and river-borne flooding.



Commonwealth of Massachusetts  
**2013 State Hazard Mitigation Plan**

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**APPENDIX C.  
BEST PRACTICES**

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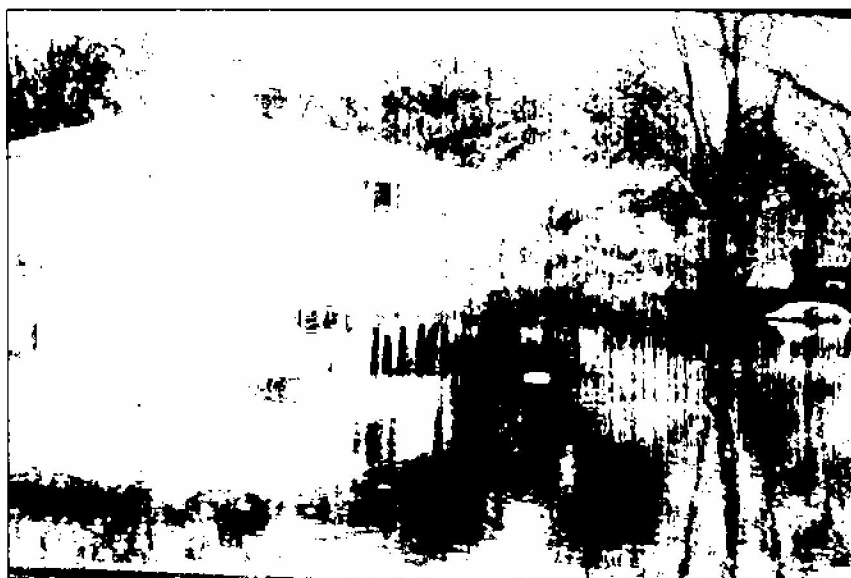
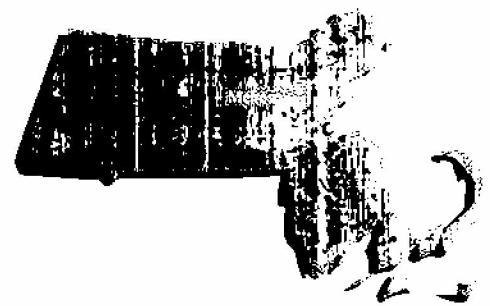


FEMA

# Best practices

Disaster Mitigation Working in Massachusetts

## New Culverts Lower Flood Risks at Converse Lane



City of Melrose Photo

Melrose, MA –Before mitigation, homes along Converse Lane used to flood almost every time there was any rain.

The City of Melrose took to heart the lessons of the Mother's Day Storm of 2006, when several feet of water inundated streets, school yards, and playing fields, causing damages to residences and businesses. Since then, Melrose officials have taken significant steps to reduce the risk of flooding in several areas of the city.

With financial grant assistance from the Federal Emergency Management Agency (FEMA), the city has completed drainage improvement projects at three locations where flooding proved troublesome in 2006 – at Ell Pond in the city's central core, in Ward 2 at Melrose's boundary with the Town of Wakefield, and in the

Converse Lane neighborhood at the opposite (southwestern) corner of the city.

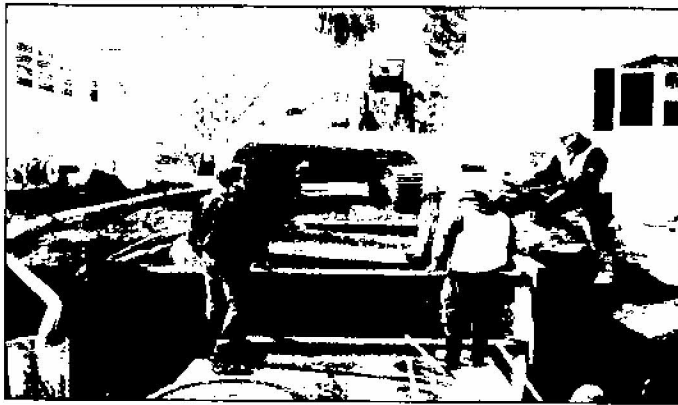
"The residents of Converse Lane had been hit by flooding too many times," said John Scenna, Deputy City Engineer and Director of the Operations and Engineering section of the city's Public Works Department. "We had to do something to give them some relief."

Historically, flooding in the Converse Lane area of Melrose has been an almost twice-a-year event. Lying just east of the Middlesex Fells Reservation (MFR), a 2,600-acre state park, the neighborhood was commonly flooded to depths of up to

three feet, and occasionally much deeper, by water draining from the Reservation following even moderate rainfall.

The culverts beneath Washington Street (at the eastern boundary of the MFR) and Converse Lane could not handle all the water during the peak of the rainfall runoff. The water backed up, existing catch basins were filled to overflowing, and streets, yards, and basements would be temporarily awash. Floodwaters often covered vehicles parked on Converse Lane, and at least one house was flooded so many times that it was declared a "repetitive loss structure" by FEMA.

## practices



"We had to tear up streets, lawns and backyards with the least possible inconvenience to the residents," said John Scenna, Deputy City Engineer.



Previously flooded neighborhood today, in photograph taken at same location "You can't tell it was ever ripped up," said one resident.

In the Natural Hazards Mitigation Plan for the City of Melrose, completed in December 2004, flooding was recognized as a significant weather-related hazard to the city. Inadequate capacity of several of the main city culverts to transport the storm water runoff generated during large rainfall events was determined to be the immediate cause of the flooding, and the Converse Lane neighborhood was identified as one of nineteen high-flood-hazard areas in which such undersized culverts were the main cause of flooding.

In response to the conclusions of the Mitigation Plan, the city proposed replacement of the undersized culverts and construction of additional catch basins at Converse Lane. The existing 30-inch and 24-inch culverts beneath Washington Street and Converse Lane were replaced with 48-inch culverts.

Farther downstream, at the eastern end of the neighborhood, the 48-inch culvert beneath Pleasant Street that carried storm water to Spot Pond Brook was replaced with an 8-foot wide by 4-foot high concrete box culvert.

"While other drainage improvements in the city, such as those at Ell Pond and Ward 2, addressed flooding problems over larger areas, the Converse Lane project focused on a single, small neighborhood," said Scenna. "But it was no less challenging to complete, as we had to tear up streets, lawns, and backyards with the least possible inconvenience to the residents."

Did the Converse Lane project pass the test posed by the floods in March 2010? Bob Beshara, Melrose City Engineer and Superintendent of Public Works, thinks so.

"The neighborhood was a lot drier this spring than during past flood events," said Beshara, "even though this year's storm is considered the most severe to hit this area since Hurricane Diane in 1955. Thanks to the drainage improvements, there was no flooding on Converse Lane, not even any puddles. And Washington Street didn't flood either, because the new larger culvert kept up with the flow, even at the peak of the storm runoff."

Scott MacLeod, Hazard Mitigation Grants Coordinator for the Massachusetts Emergency Management Agency (MEMA), considers the Converse Lane project to be a mitigation success story, and "a best-practice model" for other communities.

Construction of the new drainage system for Converse Lane was made possible with a grant from FEMA's Pre-Disaster Mitigation Grant Program, which provides funding for hazard-mitigation planning and the implementation of mitigation projects prior to a disaster event. The Federal share of project costs was \$1.08 million, leaving the remaining \$400,000 the responsibility of the community.

## Disaster Mitigation Working in Massachusetts

Federal Emergency Management Agency  
Region I  
Federal Insurance & Mitigation Division  
99 High Street, 6th Floor  
Boston, MA 02110



**FEMA**

Telephone 617-832-4761  
[www.fema.gov](http://www.fema.gov)

To learn more about FEMA mitigation grants, please contact:

Massachusetts Emergency Management Agency  
400 Worcester Road  
Framingham, MA 01702



Mitigation Grants Manager  
Telephone 508-820-1445

[www.mass.gov/mema](http://www.mass.gov/mema)

**dcr**  
Massachusetts



Massachusetts Department of Conservation and Recreation  
251 Causeway Street, 8th Floor  
Boston, MA 02114

State Hazard Mitigation Officer  
Telephone 617-626-1406



FEMA

# Best practices

Disaster Mitigation Working in Massachusetts

## New Drainage System Averts Flooding in Melrose



**"The new drain system at Eli Pond saved our city."**

**—Ed Kelly, Director  
Melrose Emergency Management  
Agency**



Photo—City of Melrose

Water surrounds the Melrose Towers Condominiums just north of Eli Pond during the Mother's Day Flood in 2006

Despite ten days of record-breaking flooding across northeastern Massachusetts in March 2010, the City of Melrose "dodged the bullet," thanks to the new drainage system for the city's Eli Pond.

Runoff from several previous storms, most recently the "Mother's Day Storm" in 2006, led to flood depths as high as six feet in buildings, yards, and streets to the north of Eli Pond. This Spring, the water barely topped the banks of the pond.

"The system worked almost flawlessly," said Bob Beshara, Melrose City Engineer and Superintendent of Public Works. "The new drainage system replaced part of the

existing system and enhanced our ability to move floodwaters rapidly through the city's central core area, while at the same time minimizing their impact."

Eli Pond, a natural body of water within the City of Melrose, is bordered by homes, streets, recreational fields and landscaped park strips. The 23-acre pond receives water from an 1,100-acre watershed, which includes parts of the towns of Stoneham and Wakefield. Water leaves the pond through an outlet at its southeastern corner and flows southward be-

neath city streets to ultimately discharge to Lower Spot Pond Brook.

The original outlet channel allowed water to begin draining from the pond only when it became nearly full, so that the water level could not be lowered in anticipation of large storms and the resulting runoff.

The Eli Pond Project changed all that, and while storm runoff can't be prevented, it can now be managed to reduce its effects. A 2001 study of flooding at Eli Pond identified alternatives for eliminating, or at least

## practices

minimizing the problem. In early 2005, city officials began to seek funding for the design and construction of what became known as the "Ell Pond Project."

With funding of \$1.75 million provided by the Federal Emergency Management Agency's (FEMA) Pre-Disaster Mitigation (PDM) program, supplemented by \$1 million in city funds, construction of the new drainage system was completed in time for its first real test by the recent rainfall and accompanying floods of early 2010.

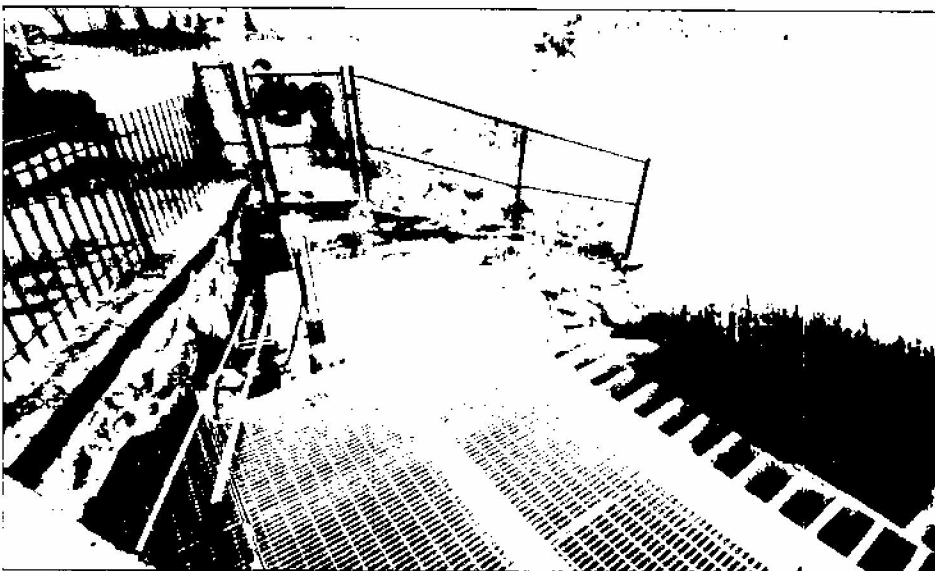
The Ell Pond drainage project consists of a control gate structure at the southeastern corner of the pond and a 3,500-foot long, 48-inch pipe that extends from the control gate to the outlet at Lower Spot Pond Brook.

During periods of peak runoff following the storms of March 2010, the level of Ell Pond rose to as high as two feet above the top of the outlet pipe, and water was draining from the pond at a rate of 100 cubic feet (748 gallons) each second. Draining this much water this rapidly from Ell Pond reduced the extent and depth of inundation of areas around the pond compared to that in the March 2006 flood.

For instance, the West Knoll Soccer Field was flooded by 3 to 4 feet of water in March 2006; in March 2010, only the perimeter of the field was flooded. And the Cabbage Patch Park in front of the new middle school, which was covered by 2 to 3 feet of water in 2006, was not flooded at all this year.

"It's all about water-level management," said John Scenna, Deputy City Engineer and Project Manager for the Ell Pond work. "We can now adjust the level of the pond as conditions require, either raising it high enough to prevent wave action from eroding unvegetated parts of the shoreline or lowering it before storm runoff begins to enter. We did this in March, so the pond served as a temporary storage basin for at least part of that runoff."

The gate that controls the level of the pond is automatically activated to main-



Water enters the new drainage system through the crest gate at the southeast corner of Ell Pond

tain or adjust the water to desired, pre-selected elevations, but the mechanism can also be manually activated. The control gate structure incorporates a sturdy debris trapping "trash rack," and a high, level platform that provides a safe perch from which maintenance workers can remove trees and other woody debris that become lodged against the rack.

The construction phase of the new drainage system brought a year of inconveniences – such as torn up roads and temporary water hookups – to the citizens of Melrose. The rewards for their patience, in addition to a lessening of the flood risk to the areas around Ell Pond, were amenities such as new sidewalks and street paving along the construction route, beautiful landscaping around Ell Pond, a skate park, and new baseball and soccer fields.

"The new drain system saved our city," said Ed Kelly, Director of Melrose's Emergency Management Agency. "During earlier floods that inundated parts of central Melrose, large areas were underwater for as long as a week to 10 days. But in 2010, much smaller areas and only scattered depressions near Ell Pond were flooded to much lower depths than in those earlier floods, and the water drained away within a few hours to a few days at most. Now that's a success story."

Disaster Mitigation Working in Massachusetts



**FEMA**

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FEMA photo by Michael Moore

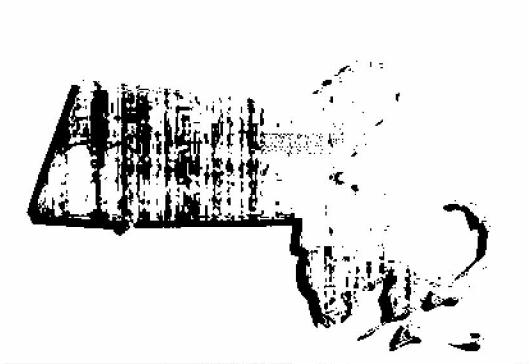


FEMA

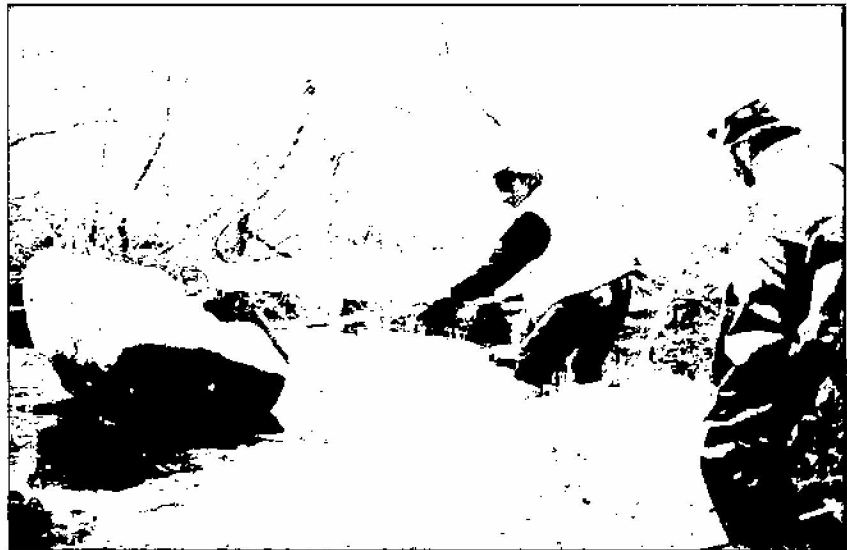
# Best practices

Disaster Mitigation Working in Massachusetts

## Several Small Steps Lead to Safety



*Peabody residents have been hit by several major floods in the past 20 years. The most recent was in May 2006, when Mother's Day Storm hit the area.*



Photo—City of Peabody

A major contributor to the high water problems in Peabody was the large amount of debris that had accumulated in the local waterways

Flooding is the most common natural disaster threatening United States residents today.

While each state has its own set of hazards and risks to deal with, the majority of states count flooding as the most likely disaster citizens will have to face, and Massachusetts is no exception. In the past 20 years alone, there have been at least 16 major floods in Massachusetts, causing hundreds of millions of dollars in damages.

The City of Peabody, which lies about 15 miles northeast of Boston and three miles from the Massachusetts coast, has seen its share of those floods. Three streams – Goldthwaite, Strongwater and Proctor Brooks – converge in downtown Peabody to form the North River, which flows into the Atlantic Ocean.

"The problem with the hydrology here is that all the water is going to one place," said Chris Tighe, Peabody's Director of Emergency Management. "If we can get the water to the North River, we're going to be ok. Our best asset is low tide, when the ocean just drains all the water out of the system. The problem is,

when we get back-ups, there's no place for the water to go."

In May 2006, runoff from the famous "Mother's Day Storm" inundated downtown Peabody to depths of three to four feet, in some areas reaching as wide as a half-mile across. With no convenient means of egress, in some areas the water took as long as 48 hours to recede. In assessing the aftermath of the 2006 flood, Peabody officials realized they needed to make some changes to their drainage network to lessen effects of future floods, as well as upgrade several critical systems that had been threatened.

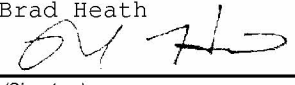
One of the first measures Tighe undertook was to secure funds to clean out the channels of several streams running throughout Peabody. To get the money needed to accomplish this considerable task, Tighe applied to the U.S. Department of Labor for a National Emergency Grant (NEG). NEGs allow communities to temporarily increase their workforce through the employment of individuals affected by

large, unforeseen economic events that cause significant job losses. Peabody qualified for such assistance and, through the Valley Works NEG Northeast Flood project, was awarded \$540,000 to conduct the stream cleanup.

Beginning in November 2006, Tighe and his crew canvassed more than 10 miles of waterways, clearing out debris and refuse. They discovered early on that a major contributor to the high water problems Peabody had suffered was the large amount of garbage that had accumulated in the channels through and around the city.

"As an example, we removed a mattress that had become wedged in one of our culverts," reported Tighe. "And as soon as we pulled it out, the water level immediately dropped drastically, probably as much as two to three feet."

The clean-up project took Tighe and his team almost two years to complete and ultimately resulted in the removal of more than twenty 44-cubic yard containers of recyclables, junk and organic material.

<b>EPA</b> United States Environmental Protection Agency Washington, DC 20460 <b>Work Assignment</b>		Work Assignment Number 0-45								
		<input type="checkbox"/> Other <input type="checkbox"/> Amendment Number:								
Contract Number EP-C-16-003	Contract Period 07/01/2016 To 06/30/2017 Base <input checked="" type="checkbox"/> Option Period Number	Title of Work Assignment/SF Site Name Green Infrastructure Program								
Contractor EASTERN RESEARCH GROUP, INC.		Specify Section and paragraph of Contract SOW See PWS								
Purpose: <input checked="" type="checkbox"/> Work Assignment <input type="checkbox"/> Work Assignment Close-Out <input type="checkbox"/> Work Assignment Amendment <input type="checkbox"/> Incremental Funding <input type="checkbox"/> Work Plan Approval		Period of Performance  From 04/04/2017 To 06/30/2017								
Comments:										
<input type="checkbox"/> Superfund    Accounting and Appropriations Data <input checked="" type="checkbox"/> Non-Superfund										
Note: To report additional accounting and appropriations data use EPA Form 1900-69A.										
SFO <input type="checkbox"/> (Max 2)										
Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code
1										
2										
3										
4										
5										
Authorized Work Assignment Ceiling										
Contract Period:		Cost/Fee:		LOE:						
07/01/2016 To 06/30/2017										
This Action:										
Total:										
Work Plan / Cost Estimate Approvals										
Contractor WP Dated:				Cost/Fee				LOE:		
Cumulative Approved:				Cost/Fee				LOE:		
Work Assignment Manager Name    Katelyn, Lynch  <div style="display: flex; justify-content: space-between;"> <div>_____ (Signature)</div> <div>_____ (Date)</div> </div>							Branch/Mail Code: Phone Number: 202-564-2740 FAX Number:			
Project Officer Name    Tangela Cooper  <div style="display: flex; justify-content: space-between;"> <div>_____ (Signature)</div> <div>_____ (Date)</div> </div>							Branch/Mail Code: Phone Number: 202-566-0369 FAX Number:			
Other Agency Official Name  <div style="display: flex; justify-content: space-between;"> <div>_____ (Signature)</div> <div>_____ (Date)</div> </div>							Branch/Mail Code: Phone Number: FAX Number:			
Contracting Official Name    Brad Heath <div style="display: flex; justify-content: space-between;"> <div>             _____            (Signature)         </div> <div>4/4/2017 _____ (Date)</div> </div>							Branch/Mail Code: Phone Number: 513-487-2352 FAX Number:			

**PERFORMANCE WORK STATEMENT  
CONTRACT EP-C-16-003  
WORK ASSIGNMENT 0-45**

**Title:** Support for Green Infrastructure Program

**Work Assignment Contracting Officer's  
Representative (WACOR):**

Katelyn Amraen  
Permits Division  
Office of Wastewater Management  
U.S. Environmental Protection Agency  
Washington, D.C. 20004  
202-564-2740  
202-564-6392 fax  
[amraen.katelyn@epa.gov](mailto:amraen.katelyn@epa.gov)

**Alternate WACOR:**

Jamie Piziali  
Permits Division  
Office of Wastewater Management  
U.S. Environmental Protection Agency  
Washington, D.C. 20004  
202-564-1709  
202-564-6392 fax  
[piziali.jamie@epa.gov](mailto:piziali.jamie@epa.gov)

**Period of Performance:** April 4, 2017 through June 30, 2017

**Objective:** The tasks identified below will facilitate the adoption of cost-effective green infrastructure practices at the local level by providing support, training and outreach to aid communities in implementation of improved stormwater management. This support is authorized under Section 3.1 of the contract performance work statement: National Program Development and Oversight, as well as 3.4 Technical and Administrative Program Support, 3.7 Outreach, 3.8 Technical Writing and Editing, and 3.9 Support for Meetings, Workshops, Conferences, and Webcasts.

**Purpose:** Municipalities are increasingly interested in green infrastructure to complement single-purpose “gray” stormwater infrastructure. Green infrastructure manages stormwater by preserving natural features, mimicking natural processes, and providing multiple environmental and social benefits. EPA encourages the use of green infrastructure in National Pollutant Discharge Elimination System (NPDES) permits and enforcement agreements. EPA’s outreach and technical assistance has increased awareness of the function and benefits of green infrastructure. However, a range of institutional and technical barriers still limit the integration of these approaches into municipal stormwater programs. The green infrastructure program will continue to provide outreach and technical assistance to address these barriers and demonstrate

the economic, public health, and environmental benefits that green infrastructure can provide while also helping communities meet regulatory requirements.

### **Tasks:**

#### **TASK 1: Case Studies, Fact Sheets, Newsletters, Compendiums, and General Reports**

The contractor shall provide support for the development and formatting of materials related to the design, implementation, costs, maintenance, and environmental/economic/social costs and benefits of green infrastructure practices and stormwater programs. This support may also include additional materials related to the green infrastructure technical assistance program, including further refining of existing materials, and further synthesis of those reports for ease of use. Draft documents shall be provided to EPA for comment and revised by the contractor according to the comments received. For each draft document and final document, new drafts or final documents shall be completed within 14 business days of receipt of comments from EPA. All final documents shall be 508 compliant.

EPA anticipates development of approximately **1 compendium**, and **1 other product** of a similar nature of these products during this period of performance.

#### **DELIVERABLES:**

- Kickoff meeting with EPA to discuss the technical direction within 5 working days of receipt of the technical direction.
- An outline of product to be provided within 5 business days of kickoff meeting if requested by WACOR.
- First draft of the product to be provided within 14 business days of kickoff meeting.
- Final deliverable (or additional drafts if requested) within 14 business days of receipt of EPA comments on draft unless a later date is specified by WACOR.

#### **Task 2: Outreach, Communication Materials, Graphic Design and Production**

As the technology available for communications and outreach expands to include new formats and media, OW Green Infrastructure continues to adapt the delivery of its information to include current (web and print) as well as newer technologies (web video, blogging, etc). Provide editorial and graphic support to produce various print and multimedia products that explain OW Green Infrastructure programs, projects and policies. These products may include the following types of materials or related items: short booklets, brochures, posters, presentations, fact sheets, press kits, information packets, research, communication strategies, business cards, postcards, advertisements, flyers, mailings. All the materials developed (including photos and the highest resolution versions of graphics and any vector-based files) in the creation of these files shall also be delivered to EPA.

EPA expects approximately **1 product** to be requested during this period of performance.

#### **DELIVERABLES:**

- As directed by WACOR, provide audio and /or videography support to produce videos or

podcasts formatted according to EPA specifications for web posting. Within 7 business days of technical direction a storyboard, outline, or scripts for the requested product. After approval of initial materials, deliver product within 14 business days unless a longer period is specified by EPA WACOR.

- As directed by WACOR, provide draft graphic design and production support posters, website or other similar large format information products within 7 business days of technical direction. After receiving comments from EPA, produce a final (or another draft if requested) within 14 business days unless a longer period is specified by EPA WACOR.

### **Task 3: Webcast Support and Archives**

OW Green Infrastructure team hosts approximately four national webinars a year (generally quarterly) related to the successes and challenges associated with implementing green infrastructure best management practices. Historically these webinars have an average of 500-800 participants. See: <https://www.epa.gov/green-infrastructure/green-infrastructure-webcast-series>. The contractor shall convert webcast presentations into 508-compliant materials suitable for EPA for posting on EPA's website and/or EPA's YouTube channel.

EPA anticipates requiring support with posting approximately **2 webcasts** on YouTube during this period of performance.

#### **DELIVERABLES:**

- After receiving necessary files from EPA the contractor will create 508 compliant materials for posting on EPA YouTube channel within 2 weeks of receiving materials. This includes:
  - A high resolution video (generally MP4 or similar file type), timed caption files (.srt format or similar) that have been checked and verified for accuracy, any text transcripts of materials created for files, and the YouTube entry description in this format:
    - Title (100-character limit)
    - 5-10-line description with URL(s) to promote
    - 5-10 tag words separated by commas.
- If directed by WACOR, the contractor will instead provide 508 compliant power point presentations in PDF format and transcripts for use on EPA's website as an alternative to using YouTube.

### **TASK 4. Website Support and Outreach**

The contractor shall provide technical support in maintaining and developing the green infrastructure website. The contractor shall provide support in developing new content or web pages as requested via technical direction by the EPA WACOR. The support may include, but is not limited to, writing introductory content, editing existing content, reviewing content, identifying links, preparing new material, providing recommendations to reorganize content,

development of new professional graphics, social media graphics, videos, logos, and other graphic-intensive materials such as infographics.

EPA anticipates submitting **2 requests** during this period of performance.

**DELIVERABLES:**

- The contractor shall respond to requests from the EPA WACOR for support of new, edited or revised content within 3 business days either with a written response or if requested, a level of effort to complete the request.
- A draft of fact sheets/infographics/logos/social media graphics and other similar items requested will be delivered within 7 business days of the request. If the contractor has questions regarding any graphics/photographs, they should communicate directly with the WACOR before submitting a draft. If EPA requests additional edited drafts, the contractor will deliver within 3 business days, unless a longer period is specified by WACOR. After EPA sends final comments the contractor will deliver a final version of the document within 1 week. The contractor must ensure they have EPA approval before making final 508 compliant version of graphics/documents.
- For more significant reorganizations or development of new professional graphics, social media graphics, videos logos, and other graphic-intensive materials such as infographics, a draft must be provided for review within 7 business days of receiving technical direction. If the Contractor has questions regarding any graphics/photographs, they should communicate directly with the WACOR before submitting a draft. The contractor will then create a final version within 1 week and ensure they have EPA approval before making final 508 compliant version of graphics/documents.

**TASK 5: Quality Assurance Project Plan (QAPP)**

All environmental data used in decision making shall be supported by an approved Quality Assurance Project Plan (QAPP). The Contractor shall update this QAPP as needed.

**DELIVERABLES:**

- Contractor will prepare a QAPP within 30 days of work plan acceptance.
- Updates to the QAPP as needed, or requested by the EPA WACOR.

**Quality Assurance:**

This work will reference and use the contract Quality Assurance Surveillance Plan (QASP).

**Estimated Level of Effort:**

EPA estimates a total of **450 LOE** hours to complete these tasks.

**Reporting Requirements:**

The Contractor shall provide the WACOR with a breakdown of dollars spent on individual projects on a monthly basis and when requested by WACOR.

## Guidance Regarding Conferences:

The contractor shall immediately alert the EPA WACOR to any anticipated event under the work assignment which may result in incurring an estimated \$20,000 or more cost, funded by EPA, specific to that event, meeting, training, etc. Those costs would include travel of both prime and consultant personnel, planning and facilitation costs, AV and rental of venue costs, etc. The EPA WACOR will then prepare approval internal paperwork for the event and will advise the contractor when appropriate signatures have been obtained. At that point, effort can proceed for the event. If the event is being sponsored by another EPA organization, the organization providing the planning is responsible for the approval.

## Guidance Regarding Writing for EPA:

EPA products are to conform to EPA standards. Please reference EPA Stylebook <http://www2.epa.gov/stylebook>. Note also that EPA utilizes AP Style first (<http://www.apstylebook.com>) and U.S. Government Printing Office Style Manual second.

## Guidance Regarding EPA Website Materials:

When creating content for the Green Infrastructure website, the contractor shall adhere to EPA Style Guide and OneEPA Web guidelines including the following:

- Content and publications added to the website must be compliant with Agency standards, including 508 accessibility, metadata standards, and other published EPA Agency standards and requirements.
- Use of the current framework and structure of the website, unless otherwise specified.
- Multimedia image files that accompany text shall be produced and/or published using the OneEPA Web guidelines current format (.gif, .jpg (or .jpeg), .png) and vector files will also be delivered.
- New video files shall be compressed to EPA's current format (.mp4, .flv, .swf) or to new video format requirements as they become available, currently EPA uses YouTube formatting of .mp4 files and .srt (<http://www.youtube.com/user/USEPAgov>).

## New Contracting Terminology from EPA Acquisition Guide Subsection 1.6.5:

New Contracting Terminology From Environmental Protection Agency Acquisition Guide (EPAAG) Subsection 1.6.5
Contract-Level Contracting Officer's Representative (CL-COR) = Project Officer (PO)
Alternate Contract-Level Contracting Officer's Representative (Alternate CL-COR) = Alternate Project Officer (APO)
Work Assignment Contracting Officer's Representative (WACOR) = Work Assignment Manager (WAM)
Alternate Work Assignment Contracting Officer's Representative (Alternate WACOR) = Alternate Work Assignment Manager (AWAM)

New terms: CL-COR, Alternate CL-COR, WACOR and Alternate WACOR

Obsolete terms: PO, APO, WAM and AWAM